

What Resources Garner Managerial Attention in Startups? Evidence from a Randomized Controlled Trial*

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Abstract: Do startups pursue all new opportunities to acquire resources as they emerge? Or are they selective based on their prior strategic investments? We explore these questions with a randomized field experiment measuring managerial attention in startups. We offer a variety of entrepreneurial resources to high-tech, healthcare startups, and measure how their responses vary depending on the opportunity offered, prior strategic commitments made by the startup and prior resources acquired. Our findings suggest that startups vary in their levels of attention to new resource opportunities as a function of their prior strategic choices and acquired resources. By observing how new firm founders respond to a new, unexpected prompt for a potential connection to a valuable resource, we make progress towards developing a more concrete understanding of the interplay between planned/deliberate activity and improvisation in the entrepreneurial process.

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Introduction

Nowhere are the words “time is money” truer than in a startup venture. The majority of new firms die within their first two years (Audretsch, 1991). Founders race against a ticking clock to implement their initial vision, while simultaneously searching for resources to support them in building the venture. While a key definition of entrepreneurship is the pursuit of opportunity beyond resources controlled (Stevenson and Jarillo, 1990), the pursuit and acquisition of resources remains a crucial part of the entrepreneurial process. Startup founders expend significant effort pursuing resources such as funding, human capital, connections and customers to build their nascent firm (e.g. Hallen, 2008). On the one hand, prior work in entrepreneurship has portrayed startup founders as fundamentally constrained by the resources available in their local environment defined by either their social network or geography (Shane and Stuart, 2002; Grossman et al., 2010). From this perspective, entrepreneurs are defined as resource takers for whom success or failure is defined by the creativity with which they leverage existing resources (Baker and Nelson, 2005). On the other hand, startup founders seem to exhibit some strategic choice in which resources to acquire and on what terms (Hsu, 2004; Hsu, 2006). Despite the centrality of this issue in the entrepreneurial setting, the connection between a startup’s evolving strategy and its pursuit of resources is not yet well-understood. Do startups pursue all new opportunities to acquire resources as they emerge? Or are they selective based on their prior strategic investments?

How startups pursue resources is one part of a larger question about whether the entrepreneurial process is better understood as intendedly rational and strategic, or emergent and improvisational. The *ex-ante* expected value of the venture can be housed in concepts such as opportunity recognition (Baron and Ensley, 2006), or thought of more abstractly. That said, a workhorse model of entrepreneurship posits that a core market insight is translated into an organization through a series of social and economic processes (Shane and Venkataraman, 2000). Competing views have critiqued the objective nature of opportunities (Alvarez and Barney, 2007), emphasized the role of learning by doing (Ott, Eisenhardt and Bingham, 2017), and

elaborated the role of emergent processes in shaping a ventures success (Sarasvathy, 2001; Baker and Nelson, 2005).

Recent work in entrepreneurship has to some extent integrated these perspectives by emphasizing the cognitive constraints of founders and exploring the ways in which they shape how founder build their firms in the face of uncertainty (Ott, Eisenhardt and Bingham, 2017; Cohen, Bingham and Hallen, 2018; Kirtley and O'Mahoney, 2019). While these works vary in their approach, they share an emphasis in deepening our understanding of the entrepreneurial process by connecting their research to more general theoretical constructs from organizational theory. In particular, they build theories of the behavior of the behavior of entrepreneurial firms from the building block of individual managerial cognition (Felin et al., 2012).

We seek to build upon these efforts by focusing on managerial attention in entrepreneurial firms. An attention-based view of the firm (ABV) provides a micro-founded model that builds more broadly on the behavioral theory of the firm (Ocasio, 1997). Measuring managerial attention in startup firms allows us to make progress on developing a more concrete understanding of the interplay between planned/deliberate activity and improvisation in the entrepreneurial process. As the number of working hours is necessarily bounded, and the entrepreneur faces many demands on her limited time, the amount of attention which startup founders can apply to any specific challenge or issue is strictly limited. By observing how new firm founders respond to a new, unexpected prompt for a potential connection to a valuable resource, we can shed light on whether firms vary in their levels of attention to new resource opportunities, as a function of their prior strategic choices and acquired resources. As predicted by the ABV, do startup firms differ in the opportunities to which they attend depending on their prior strategy? If so, what aspects of their prior strategy affect attentional behavior the most, and for which opportunities?

To explore these questions, we conduct a randomized field experiment. Our experiment is a randomized correspondence study set in the context of invitations to participate in a pitch competition targeted towards startups in their field (in this case, the Health Tech Pitch Competition at the American Heart Association's 2018 Science Sessions). We send these invitations to a large sample of startup companies whose company

descriptions contain keywords related to cardiac health. Each subject startup is randomly assigned one of four treatments; each treatment is a different draft of the invitation email. The email versions vary only one element: a suggestion of what critical resource the startup may benefit from if it participates in the pitch event. Both popular press and academic research extoll the value added of pitch competitions and the critical resources they imbue to nascent firms (Macaulay 2018). However, extant research has yet to address which (if any) of these resources is able to meaningfully capture attention and how differing startup orientations induces heterogeneity within the ABV. To that end, the resources we utilize in our experiment are: (i) high value networking opportunities (Huang, Frideger, and Pearce 2013), (ii) feedback on the startup's product or service, (iii) funding opportunities (Brooks et al. 2014), and (iv) access to potential beta customers (Larson, 1992).

We choose to embed these questions in an experimental framework for several reasons. First, in management research, experiments have been growing in popularity as a method for establishing causality and providing convincing empirical magnitudes (Croson et al., 2007). Our experiment speaks to causal concerns by exploiting randomization as an ideal instrument. Whereas traditional observational studies may be plagued by omitted variable bias or have difficulties separating the impact of relevant startup characteristics, randomization provides reassurance that, in expectation, companies in the various treatment samples are similar on both observable and unobservable dimensions. Randomization also allows us to estimate convincing magnitudes within the domain of the experiment (Floyd and List 2016).

Second, experiments can provide a direct empirical complement to observational study, which is limited to that which the researcher can observe from archival data. While study of historical observational data can yield important insights with regards to firm preferences over resources, it does not enable us to directly assess which resources garner startup managers' limited attention. In contrast, experiments generate new data, and can be designed to generate specific types of data unavailable from observational or archival datasets. Here, we vary the messaging regarding the type of resource offered. By measuring firm-level response to these appeals, we can develop a direct measure of managerial attention. We can then use this

measure to explore which aspects of a startup firm's prior strategy impacts their attention to a new opportunity overall, and which types of opportunity are most attractive.

We document several results from our experiment. First, we see that startups appear to demand one resource—access to potential beta customers—more than the other offered resources. Considering that market access for healthcare startups is mediated by hospitals, with whom it is hard to organize beta trials, the higher demand for access to hospitals as pilot sites shows a shared understanding of which offered resource is truly rare and hard to imitate. Second, we note that startups that have evidence of a higher growth orientation (as measured by their incorporation choice) have lower demand for unexpected access to new resources, suggesting that their managerial attention is more fixed on execution of their existing plan. Third, we see that startups that are more related to the advertised needs of the partner organizations in our setting are more likely to respond to offers of feedback and beta customers—areas where fit between partners is important—as compared to funding and networking, where the resources are more fungible across opportunities.

By running a randomized experiment in this fashion, we highlight a key feature of behavioral modeling: decision making can be governed by several latent processes, which may coexist in a given population (Harrison and Rutström, 2009). While our experiment provides causal inference at the individual level, it also allows for flexibility and heterogeneity across theories (e.g., that different startups may have different motivations). Moreover, by embedding this research in an experiment, we are also able to overcome traditional shortcomings of survey design, such as improper recall (Huber and Power, 1985) or surveyor demand effects (Fleming et al., 2007). In this sense, both causality and magnitude provide important insights: causal estimates help to alleviate concerns about what drives the effect, and the estimated magnitudes can help us to run future cost/benefit analyses, estimate ROI, and speak more broadly to a practitioner audience.

Our experimental variation in the messaging to startups helps solve a major methodological hurdle in the empirical exploration of the ABV for firm behavior, both young and old. To date, data availability has

hampered researchers' ability to study the role of managerial attention and other cognitive factors on firm level behavior, especially in entrepreneurship. Similarly, research into strategic decision-making in entrepreneurship has been limited by the ability of researchers to observe the arrival of new information and opportunities, and to observe the new firm's response. To date, the majority of empirical applications of the ABV have used shareholder letters and other similar institutional artifacts (Ocasio, 2011). Mintzberg (1978) and others have noted that (i) strategic processes are often emergent and piecemeal; (ii) that managers, if asked how they came to a successful strategy, are susceptible to retrospective bias; and (iii) that unsuccessful decisions often lead to the death of the firm, introducing survival bias. These data limitations have largely been addressed through qualitative studies where researchers track a small number of firms longitudinally. While such qualitative studies have significantly advanced our knowledge of strategic decision making in startups as well as our theoretical understanding of the ABV, experiments, by directly generating data at a large scale, offer the opportunity to confirm and expand upon these qualitative findings and to extend to settings such as nascent firms that have not been explored in the past.

Managerial Attention, Resource Acquisition, and Entrepreneurial Strategy

A *sine qua non* of entrepreneurship is the acquisition of resources as a new firm transitions from a shared idea amongst co-founders into a functioning organization with tangible and intangible resources. The extent of divergence between the initial vision of a set of founders and the eventual achieved reality of the emergent startup is a matter of both theoretical significance and empirical debate. On the one hand, entrepreneurship research as a field has anchored on the concept of the opportunity as an external and objective reality of markets which are discovered by entrepreneurs (Shane, 2000; Shane and Venkataraman, 2000), while, on the other hand, other scholars have provided a strong critique of this concept based on 1) first principles and 2) the low likelihood that entrepreneurs build new businesses in this manner (Sarasvathy, 2001; Alvarez and Barney, 2007). This debate at least partially parallels a broader debate in the literature about the tension between scholars on the one hand who explore more rationalistic views of managerial

choice, and scholars who pursue and more behavioral views stemming from the pioneering work of the Carnegie school, on the other.

Two simple questions that remain unanswered in this setting are: which resources do startups want? And when do they want them? Resource acquisition is one of the fundamental processes of entrepreneurship that requires substantial effort from the top management team of early-stage startups, yet the exact manners in which startups acquire these resources and how they integrate them into the firm remains largely a mystery (Clough, et al. 2019). This gap in our empirical understanding of the growth of early stage startups underlines a broader theoretical and empirical gap in the literature around the processes through which entrepreneurs scale up their ventures (DeSantola and Gulati, 2017).

One theoretical account of resource acquisition and integration that builds naturally from these empirical observations is the idea that startups are resource takers—in the sense that they build from the resources that are proximate to them, either socially or geographically. Entrepreneurs make significant use of social contacts both to screen their potential ideas, and to launch their ventures (Davidsson and Honig, 2003; Lerner and Malmendier, 2013). The earliest source of input capital and assets into the venture are similarly near at hand as founding teams build their businesses. Early-stage founders spend a significant amount of time tending to their social networks and thinking about how to best cultivate them in order to help build their businesses (Vissa, 2011 and 2012).

The above theoretical construct suggests that ties to resources are ephemeral, and that successful managers must be creative in their acquisition and utilization of resources under significant constraint. This point of view is bolstered by existing literature on the learning and adaptation process within new ventures. The effectuation literature explores how entrepreneurs use a constrained set of processes to navigate their environment and build value in an emergent way (Saravastry, 2001), and this emergent perspective is bolstered by empirical work that shows a substantial aspect of discovery after entry from a panel of highly successful ventures (Bhide, 2000). This process of improvisation and emergent strategy is especially understandable in high velocity or high uncertainty environments where substantial aspects of the value

creation that will underlie a venture have to be learned after entry (Eisenhardt, 1989). In these environments, startup founders often have to both learn about the market as well as respond to new information through experimental, trial-and-error processes (Bingham and Eisenhardt, 2011; Bingham and Davis, 2012).

These various emergence perspectives described above tend to characterize the broader environment in which entrepreneurs navigate as neutral with respect to new firm entry, but another perspective stresses the importance of a strategic plan. This view is premised on the recognition that both competitors and resource holders alike can and will seek to minimize the potential disruption of a new firm's entry. Without sufficient resources or a strong market position, new firms are subject to the negative effects of vigorous competition in the marketplace, and to expropriation by potential partners.

To the extent that startups prospectively account for these actions on the part of competitors and key resource holders (Zott and Amit, 2007), an entrepreneurial strategy can be conceptualized as a prospective choice of one plan of actions and activities over another (Gans, Stern and Wu, 2019). A clear strategy also provides the ability to more easily make managerial decisions in light of new information, a capacity that is especially important in the high uncertainty environments that entrepreneurs attempt to navigate (Delmar and Shane, 2003). Empirically, the connection between planning and better performance of new ventures is tenuous. There is evidence that some planning—such as business plan development—is associated with both a higher likelihood of receiving funding and better chances of survival (Kirsch, Goldfarb and Gera, 2009; Delmar and Shane, 2003). Other studies, using different populations of entrepreneurs, however, find a negative effect (Dencker, Gruber, and Shah, 2009).

While empirically there is substantial variation in the degree to which entrepreneurs engage in prospective planning and entrepreneurial strategy creation (Dess, Lumpkin and Covin, 1997; Bennett and Chatterji, 2019), there is evidence that, for certain key decisions, entrepreneurs do carefully weigh the potential for different courses of action in advance of entry into the market. Entrepreneurs are calculated in choosing from whom they choose to receive external capital, and are more likely to choose an investor that will provide them a valuable status cue, even if it is under less favorable deal terms (Hsu, 2004). In

industries such as biotechnology, where alliances are necessary for value creation, entrepreneurs are careful to consider the potential for expropriation and gain in their choice of alliance partners and contract terms (Katila et al., 2008; Diestre and Rajagopalan, 2012). The prospective choice to cooperate or compete with industry incumbents also requires different investments in capabilities and resources, and the choice between investments in cooperation or competition are often driven by the advice of outside investors (Hsu, 2006; Aggarwal and Hsu 2009).

Taken in sum, there is substantial evidence of both prospective, deliberative decision making as well as of emergent, improvisational elements in the entrepreneurial process. Yet the degree to which these perspectives can be integrated into a common theoretical understanding of the entrepreneurial process is less clear. Entrepreneurs in highly uncertain environments like health technology must respond to the fast-paced arrival of new information, and incorporate these new data and perspectives into their pre-existing understanding of their market and how to create and capture value (McMullen and Shepherd, 2006). A growing number of entrepreneurship researchers have suggested that leveraging the broader perspectives of general management theories in the entrepreneurial context may allow greater clarity (Cohen, Bingham and Hallen, 2018). One particularly attractive avenue is to note that the demands of balancing the inflow of new information while still attempting to accumulate new resources and build the types of capabilities and routines required for a new organization to grow and flourish may push the cognitive limits of the entrepreneurial team (Ott, Eisenhardt and Bingham, 2017; Cohen, Bingham and Hallen, 2018; Kirtley and O'Mahoney, 2018).

How to frame the cognitive limits of the management teams of early-stage startups remains an open question. A growing number of papers, however, seek to nest the behavior of early stage firms within the broader framework of the behavioral theory of the firm (Ott et al., 2017; Cohen et al., 2018). Within this agenda, the attention-based view of the firm (ABV) provides an attractive synthesis of the broader behavioral theory of the firm, because it focuses clearly on one of the most precious and limited resources

in an early stage startup: managerial attention. We believe that the ABV can provide greater theoretical clarity to our understanding of the process of resource acquisition and allocation in entrepreneurial firms.

Within the ABV, attention structure is determined jointly by bottom-up processes (stimuli that demand attention) and top-down processes (schema-driven patterns of judgement that supply attention behavior) (Ocasio, 1997; Ocasio and Joseph, 2005). Within the traditional application of the ABV framework, managerial attention—especially top management team attention—is limited because of the span and scope of the firm (Ocasio, 1997). In short, top management teams cannot know everything about their firm and its environment simply due to the complexity of the organization. Much of the empirical attention to ABV within the context of large firms has been to the (in)ability of these firms to adapt to large changes in their environment (Shepard, McMullen, Ocasio, 2016). Clearly, this constraint may not bind in an entrepreneurial firm where the total scope and scale of the firm is more limited. However, entrepreneurial firms are limited in the ways in which the attention of their top management team still becomes a key resource. Due to the speed at which entrepreneurs must move and the high uncertainty of entrepreneurial endeavors as well as their limited manpower, the top management teams of new firms have limits to the amount of issues and opportunities they can address in any given day.

To date, the ABV has been used sparingly in the examination of nascent firms. The majority of work has provided a theoretical account of how the attention of prospective entrepreneurs tune their conception of the opportunity they are pursuing in a more macro level of opportunity development (McMullen and Shepard, 2006). As such, these accounts use the ABV as a behavioral mechanism to explain variation in the alertness of different potential entrepreneurs to different opportunities and how they form beliefs sufficient to warrant entry and persistence of activity in a nascent firm. Thus, the ABV has been used to bolster work on entrepreneurial cognition that emphasizes the differences between how entrepreneurs scan and interpret information (Alvarez and Businetz, 2001; Tang, Kacmar and Busenitz, 2012). These cognitive accounts emphasize the acquisition of information and its integration into the entrepreneur's mental account

of the opportunity being pursued, but they do not address the way in which entrepreneurial cognition influences how entrepreneurs build their firms through resource acquisition.

Here, we seek to understand the degree to which managers of early stage firms attend to signals pointing to the opportunity for different types of new resources. In particular, we use the context of an entrepreneurial program (in this case, a pitch competition) in which the field experiment at the heart of this study was embedded. Entrepreneurship programs have been increasingly recognized as critical sites to understand the entrepreneurial process (Cohen et al., 2018; Clough et al., 2018). The participation in an entrepreneurship program is not taken lightly by participants, however, as it requires committing to time-consuming interactions wherein confidential and proprietary information may be disclosed (Cohen et al., 2018; Cohen et al., 2019). Thus, attention paid to resources offered through an entrepreneurship program can be interpreted as a positive initial valuation of the potential benefits from the resources offered.

Hypothesis 1a: *Startup managers will allocate attention to unexpected opportunities to acquire new resources that appear in their environment.*

Beyond whether startup managers will allocate any attention at all to the potential for new, unexpected resources to be acquired, there are the questions of whether different resources are more or less attractive overall, and whether their attractiveness varies by the prior commitments of the firms. While we know little about the processes by which startup firms acquire most resources, an exception is the acquisition of financing by early stage startups, where there has been substantial work. A startup's ability to acquire financing is tied tightly to the human and social capital of its founders and top management team. Founding teams with a more ties to potential investors are more likely to gain funding and perform at higher levels (Shane and Stuart, 2002). Even teams with high human and social capital, however, have to dedicate a substantial amount of their attention to the acquisition of financing. Startup founders spend a significant amount of time planning their contact with potential investors and creating the right context from which to solicit capital (Hallen, 2008). It has been theorized that the attention paid by the management teams of nascent firms toward the acquisition of new financing is due in large part to the fact that it is critical in

building all subsequent resources. Firms with higher amounts of funding have been demonstrated to live longer and perform at higher rates than others (e.g. Hochberg, Ljungqvist, and Lu, 2007). Due to these performance implications and the empirical and theoretical attention garnered by early-stage funding in the literature, one might theorize that early-stage financing that would be the most important resource for early-stage startups, and thus, should be most likely to garner the startup management team's attention.

Hypothesis 1b: *While startups will be attracted to unanticipated opportunities for new resources in general, startup managers will give more attention to the opportunity to acquire funding than to opportunities to acquire other resources.*

Of course, when encountering new opportunities, startups also vary in their prior strategic commitments to that point. Within the ABV and more broadly in the behavioral theory of the firm, the beliefs and mental representations of managers are posited as key mechanisms through which some firms outperform others (Zollo and Winter, 2002; Gavetti, Levinthal and Ocasio, 2007). Within the ABV, selective attention to some issues and not others becomes “visible” at the organizational-level through a consistency of choices which can be articulated as a strategy (Ocasio, 1997). The consistent set of beliefs and cognitive frames shared by managers lead to the current state of the firm by the selective attention of management to some issues and selective blindness to others (Ocasio, 2011).

The connection between managerial-level attention mechanisms and observable artifacts of the firm's strategy is a key hypothesis within the ABV. Despite this key connection, empirical exploration of the ABV has largely depended on institutional artifacts of large (often publicly traded) firms, such as shareholder letters, where the measure of managerial attention is often mediated by multiple layers of human hands (e.g. Cho and Hambrick, 2006 or Eggers and Kaplan, 2009). While these measures provide useful insight into the performance of large firms, the extent to which they can shine direct evidence on the theoretical insights of the ABV is more limited.

In our setting, using a sample of health-related startup ventures and specific entrepreneurial program that offers a variety of resources, we believe that a more direct test is possible. If the startups in our experiment have made limited but observable commitments shaped by the distinct cognitive structures and

orientations of their management team, we should also expect to see differences in the allocation of managerial attention to new opportunities for resources.

Within healthcare technology (and more broadly in nascent technology firms), one key set of variation in managerial cognition is the degree to which core technology will allow their firm to differentiate themselves from competitors in the market (Teece, 1986; Gans, et al., 2019). Managers who expect their technology to be a key differentiator will commit more of their attention to hiring R&D oriented personnel in their venture (i.e. engineers and scientists) over business roles (e.g. sales and business development). Commitment to R&D staff can also extend beyond their immediate vision for the most profitable path for their firm and encompass aspects of their identity as entrepreneurs. Within healthcare technology, there are a substantial number of scientists who are attempting to translate their scientific discoveries into the real world. Thus, their commitment to R&D might also reflect their commitment to their identities as scientists, despite potential negative economic consequences of these identity commitments (Stern, 2004).

Similarly, prior research has shown that many entrepreneurs shape their firm with an eye to the signals their choices may send to potential investors and partners. The choice of the right investor (Hsu, 2004) or the right partner more broadly (Diestre and Rajagopalan, 2012) is thought to pave the way to a greater chance of success. In order to signal their quality and engage these partners, managers of startups look to make strides in the creation of their firm and communicate their success in achieving the “right” milestones to investors (Hallen and Eisenhardt, 2012). One of the choices that all nascent firms must make is their choice of corporate form. For the venture capital investors who provide the bulk of the early stage financing to these nascent startups, incorporating the startup venture as a corporation in Delaware is understood to be the “right” choice—Delaware’s state corporate governance rules and chancery courts are considered the gold standard in allowing the most efficient execution of investment in private firms and expedient resolution of property right disputes that may occur in future. The choice of Delaware incorporation is not taken lightly, however, as it incurs substantially higher monetary and administrative costs compared to many other state incorporations. Thus, commitment to Delaware incorporation can be thought to reflect the

expectation by startup's top management team that they will seek venture capital investment in the future, and provides a signal to future investors that they understand how to play the game of venture financing correctly. Firms that seek venture financing are expecting to grow more quickly, and thus are willing to sacrifice substantial portions of their founder's ownership stake in the company in return for the near-term resources to grow the firm (Wasserman, 2006).

We thus expect that firms with differences in their observed commitments to R&D and growth orientation will also exhibit differences in our direct measure of managerial attention. This leads to the following hypothesis:

Hypothesis 2: *Prior strategic commitments such as R&D orientation and growth orientation will lead to different allocations of attention across different resources offered.*

While the ABV provides a plausible mechanism for describing the internal processes of the firm, it provides less clarity about the connection between the firm's existing resource base, managerial cognition, and firm behavior (Pitelis, 2007; Joseph and Wilson, 2014). Empirical work seeking to account for both the role of resources and attention in the strategic decision-making of established firms has concretely shown the importance of both attention and resources in driving managerial decision-making in these contexts (Joseph and Wilson, 2014). Studying the role of attention in entrepreneurial settings limits the role of resources in startup manager's decision-making, as entrepreneurship is characterized as pursuing opportunities ahead of resources (Stevenson and Jarillo, 1990). Within these nascent firms, the resource base is small and relatively well-delineated. Thus, studying the allocation of attention within startups provides a useful test bed for exploring the degree to which a firm's resource base shapes managerial cognition.

A key resource within healthcare technology firms is patents, and the acquisition of patents shapes firm's behavior in important ways. The degree of patent protection for the opportunity that a startup pursues will shape the way in which it cooperates or competes with established firms (Teece, 1986; Diestre and Rajagopalan, 2012). While patents provide a mechanism to defend its appropriation of value for a particular

opportunity (Katila and Mang, 2003), relatively few patents are ever involved in a patent suit (Lanjouw and Schankerman, 2001). This suggests that the pursuit of a patent lies less in the explicit forestalling of competition, and more in its provision of a tangible asset which subsequently allows for potential exchange in a market place for ideas (Arora, Fosfuri and Gambardella, 2001). Moreover, the timing of alliances between new and incumbent firms is tied tightly to the grant of new intellectual property (Gans, Stern and Hsu, 2008), suggesting that the acquisition of new patents will shift managerial attention to new opportunities for building value within the firm.

Early-stage funding is also a critical resource for technology startups and the staged nature of funding in this area of entrepreneurship requires that even startups with committed capital must plan the acquisition of their next round of funding. Entrepreneurs put a significant amount of thought into crafting their message and image through the careful manipulation of symbols (Zott and Huy, 2007) and put careful effort into timing their interactions with potential investors in order to provide positive news of their firm's recent achievements (Hallen and Eisenhardt, 2012). These efforts require a relatively well-developed mental model of how venture capitalists will evaluate their projected image and achievements. The creation of these mental models will likely have an impact on how the managers of startup firms view any unexpected opportunities for the acquisition of new resources.

Using prior funding and patents as examples of key resources that should shift the mental models that startup managers use to scan their environment, we hypothesize that:

Hypothesis 3: *Prior resource accumulation of the firm will lead to different allocation of attention across different resources offered.*

Lastly, we believe that the perceived relevance of the opportunity should clearly influence how much managerial attention an unexpected opportunity may garner. One key question in the entrepreneurship literature is how and how far founders search for the resources with which they will transform their perceived opportunity into a viable organization. Specifically, do they build their organization with resources that are near at hand? Or do they dedicate a substantial portion of their time to scanning the

environment for resources with which they may create unique value? Critical to these questions is how similar a potential resource has to be to a startup's current strategy in order to garner managerial attention. In the context of healthcare technology, a key metric of distance is the disease area for which the startup's product or service is targeted. While their product or service might be applicable across multiple disease areas, the firm will have had to spend significant time acquiring knowledge and contacts amongst clinicians, payors, and key stakeholders in healthcare that are specific to the disease area that they are pursuing. Thus, we expect that:

Hypothesis 4: *Managers will allocate more attention to opportunities for resource accumulation if the opportunity appears closely related to the disease area focus of the company.*

Context and Setting

We conduct our experiment in partnership with Energizing Health. Energizing Health is a non-profit organization with a self-described mandate “to solve health care's big challenges.” Originally sponsored by the Kauffman Foundation, Energizing Health has grown into an organization that aims to connect early stage health care companies with large health care organizations. To do so, among other activities, Energizing Health organizes a variety of startup pitch competitions in conjunction with industry associations and events such as SXSW. The pitch event we utilize took place at the 2018 Health Tech Summit at the American Heart Association's (AHA) Scientific Sessions, a conference designated for the purpose of discussing trends in digital healthcare solutions and health IT in the cardiac space. The Scientific Sessions comprise five days of programming, including poster and invited sessions, abstract presentations, and science and technology exhibitions. They attract over 13,000 medical professionals and research scientists, as well as large payor and provider organizations.

In advance of the pitch event, AHA identified four focal “pain points” (Cardiac Rehab, Stroke Rehab, Heart Failure, and Arterial Fibrillation (AFIB)) to drive the selection of applicants by Energizing Health and make explicit the connection between the AHA's needs and the startups' solutions. A judging panel

comprised of a selection of healthcare venture capitalists and executives from large payor and provider organizations was chosen around this expertise to judge the pitch competition.

Ultimately, over 100 digital health and medical device companies applied for the 10 finalist slots. The two-day event offers participating startups significant opportunity, as it includes on-site coaching, curated introductions to VIPs, and a networking event with partners. The event culminates in the pitch competition. Throughout the two-day event, a group of selected applicants are given the chance to meet and discuss collaboration and development opportunities with key stakeholders within healthcare, including hospital systems and care centers, payors, investors, technologists, and other industry leaders.

Experiment Design

To solicit applicants for the AHA event, Energizing Health, through the research team, sent email invitations to a large selection of startup companies who advertise their products, services or R&D focus as being in some way related to the cardiac health space. Email invitations are a common way for entrepreneurial pitch event organizers and their partners to communicate with potential applicants. These email communications can be used to highlight different channels of interest (see e.g., Bernstein et al., 2017) in the experimental setting. Accordingly, our experimental design strategically manipulated information pertaining to the benefits of the pitch event within each email invitation. The baseline email text is as follows:

SUBJECT LINE: [Experimental Condition Subject Text]! Apply to pitch at the AHA Health Tech Competition 2018

Dear <company_name>,

I'd like to invite you to apply to pitch at the 2018 Health Tech Pitch Competition, hosted by Energizing Health and the American Heart Association in Chicago on November 10th, 2018.

*The AHA Health Tech Competition offers innovative startups the opportunity to
[Experimental Conditions Text]*

*The pitch event takes place at the American Heart Association 2018 Scientific Sessions,
which attracts over 12,000 professional attendees from over 100 countries.*

*Submit your application landing link] by <<Deadline>>. Applicants should have an
innovative technology that incorporates evidence-based health research and a working
prototype or MVP.*

<<Signature Block>>.

To create the distribution list for this email, we scrape Crunchbase, a web platform designed to provide business information about companies, to identify a list of all U.S. startups working on a product or service related to cardiac health outlined above. In addition to Crunchbase, we utilize the public database of SBIR grant award winners maintained by the SBA (www.sbir.gov). We identify all startups in both databases that were founded after 2008 and whose company descriptions contain one or more of 150 cardiac health keywords identified by a cardiology expert as being associated with cardiac health and treatment. This process yields a sample of 821 startups and their associated contact emails. We then collect contact and demographic information on these startups as described in the data section below. Finally, we randomize the resulting sample of startups into one of four treatments, which includes the above email context as well as similarly designed and associated landing page on the Energizing Health AHA pitch event website.

The *ex-ante* collection of demographic information allows us to block our treatment design on two key dimensions, informed by an observational pilot conducted prior to the experiment. Blocking is a randomization procedure whereby the potential subjects are stratified by relevant covariates (which may impact treatment outcome). Randomization is then implemented within each block as opposed to across all blocks. The purpose of blocking is to reduce variability and potential confounds within treatments. To wit,

blocking allows the researcher to produce more reliable estimates of the treatment effects.¹ In this experiment we blocked on two covariates: distance to the pitch event and startup age. Ex ante, there is reason to believe that newer startups are more predisposed to pitch at local events, or that older companies have different attention-capture responses. Our observational study results confirmed these hypotheses. This observational pilot study utilized data provided by Energizing Health on invitees to previous startup events (Pediatric Health Pitch at SXSW 2016 and 2017 and the Impact to End Cancer Pitch at SXSW 2017). The data included the universe of companies invited to apply to these events as well as who applied. The data also provided information on founding year of each startup, whether the founders went to a top-ranked university, and geographic distance to the event). In the observational data from prior pitch events, we observe that startups located closer to the event site were more likely to apply, as were younger startups.

Once blocked, our experimental manipulation involves editing each email draft to highlight distinct key resources associated with participation in the pitch event. For instance, a “Funding” draft highlights the event’s potential to help secure outside investment and the opportunity to meet marquee healthcare investors, while a “Networking” draft highlights the event’s potential to create new professional contacts through introductions to VIPs and networking opportunities. Further, to make the treatments more salient, each email links to its own landing page on the event application site, which uses similar language to promote that specific resource. We utilize four treatment arms, for four distinct resources identified as being important to the entrepreneurial production function and eventual startup success: (i) high value networking opportunities, (ii) feedback on the startup’s product or service, (iii) funding opportunities, and, (iv) access to potential beta customers. The relevant language used for each resource is summarized in Figure 1. (Full email drafts and landing pages can be found in the appendix.)

We randomly assign one of the four treatment email drafts to each recipient in the database using the blocking protocol described above. For example, suppose there were 500 potential startups in our database.

¹ For a thorough review of blocking and other randomization procedures, see e.g. Glennerster and Takavarasha (2013).

125 would receive the email highlighting funding opportunities with early investors, 125 would receive the email highlighting the opportunity for high value feedback on their product/service, 125 would receive the email highlighting the potential for beta customers, and the remaining 125 would receive an email highlighting high value networking opportunities. Importantly, this design affords us various measures of interest (opens email, clicks through to event website, applies to participate).

Importantly, changes to email and landing pages are considered a fairly weak manipulation in the field experiment context. Companies should be predisposed to respond to the email irrespective of the specific resource offered, and the differences between the email drafts themselves are relatively minor (all ultimately advertise a pitch event). Our experimental design can thus be considered conservative, as it is likely to be biased against finding large differences in importance across the different resources. Thus, if we observe any significant differences across the conditions, it suggests that there is substantial importance to the underlying resource relative to the other conditions.

Data and Empirical Results

Overall, we sent email invitations to 821 cardiac related startup companies. Of these emails, 106 bounced, leaving a final sample of 715. Of the remaining emails, 521 (63.46%) were (at least) opened, and 130 (15.83%) of those had their internal link clicked through to the pitch competition landing page appropriate to their treatment arm. These numbers markedly outperform industry benchmarks set by a leading marketing platform (“Email Marketing Benchmarks” 2018). To track activity related to these emails, we employ Yet Another Mail Merge (YAMM), an email marketing solution.

In addition, we collect data on a company’s age, business form, contact information, and patenting and fundraising activity at the time of the invitation. Data on company age is collected either from Crunchbase or the SBIR database. We gather information on business form and incorporation by matching to the Division of Corporate Entities Database for the State of Delaware. We determine company age by examining the WHOIS data (whois.icann.org) for their websites to identify when the business’ web

presence was established, and use the earlier of that date or the incorporation date as the founding year of the company. Contact information was collected via web search from a variety of sources. Patenting information comes from the U.S. Patents and Trademarks Office and funding data comes from Crunchbase. In addition, we calculate a keyword relatedness score tying together each company's description with the keywords provided in the AHA's call for applicants. The score is defined as the number of key words in the firm's abstract that match the AHA's call for applicants. Finally, we scrape LinkedIn for data on each invited company's employees. These LinkedIn data provide us with a rough estimate of the number of employees per firm, as well as each listed employee's job title. From these job titles, we code whether that employee is oriented towards Science, Business, Engineering, and/or Operations. We further define as an "R&D oriented firm" any startup where 50% or more of their employees are scientists and engineers.

Summary and descriptive statistics on these startups are presented in Table 1. We identify 29% of the firms as oriented towards research and development. The majority of startups in the sample (530) are incorporated in Delaware, indicative of a growth orientation. 216 of the startups have been granted patents, and 316 have secured positive amounts of external financing, indicative of prior resource accumulation.

TABLE 1: SUMSTATS

Since blocking procedures must be conducted before emails are sent, Table 2 presents a balance comparison of the startups in the four treatment groups, for the sample of 715 startups where our email invitations did not bounce. As can be seen from the table, the groups are similar to each other in characteristics, and there are no statistically significant differences across groups.

TABLE 2: BALANCE POST EMAIL BOUNCES

Response to Unanticipated Opportunities

Across orientations and planning schema, an open question is the extent to which we can capture any attention of startup managers with our experimental design. We start by comparing the raw response data to each email in Figure 2. Through our mail-merge software, we are able to identify whether or not the startup opened the email, clicked through to the application page, applied, or otherwise sought out additional information. Unless otherwise noted, for the purposes of the analysis that follows, we define expression of interest as either clicking through the link in the email or applying to the event. As noted by MailChimp (<https://mailchimp.com/help/about-open-and-click-rates/>), because open rate tracking relies on images, it isn't 100% accurate (if a recipient's email client has images turned off, the tracking image won't load, and the email will not register as opened).

As can be seen immediately from Figure 2, the “Beta Customers” treatment dominates in magnitude in both emails clicked and applications to the pitch event. The observations in Figure 2 suggest not only that managers are willing to turn their attention to offers of unexpected resources in general, but also that there is variability by type of resources, suggesting the need for further exploration. In Table 3, we formalize the exercise in Figure 2 using binary choice models, where the outcome of interest is whether or not the startup engaged with the invitation email and landing page in some meaningful way. Table 3 presents the estimates from logit models where the dependent variable is an indicator as to whether or not the startup expressed either level of interest: by clicking the link contained in the email or eventually applying to the pitch event. In the column (1), the dependent variable is an indicator for clicking through the link in the email, in column (2), the dependent variable is an indicator for applying to the event, and in column (3), it is, for robustness, applying conditional on having opened the email. For the purposes of this estimation, and all others unless otherwise noted, we take the “Funding” treatment to be baseline, as it is the most commonly explored entrepreneurial resource in the literature.

TABLE 3: BASIC TREATMENT EFFECTS

Hypothesis 1a predicts that startup managers will allocate attention to unexpected opportunities to acquire new resources while Hypothesis 1b predicts that differentially more attention will be allocated to opportunity to acquire funding compared to other resource opportunities. We test these hypotheses in Table 3 where we find evidence overall of attention to new resource opportunities, but find evidence against differentially more allocation of attention toward funding. The results in all three columns suggest that the Beta Customer draft generates significantly more interest than all other treatments, relative to the feedback baseline. We also observe a marginally significant positive interest capture (p-value <0.15) for the Networking condition, at around half the magnitude of that for Beta Customers. In contrast, the Feedback condition does not indicate statistically significant interest capture relative to the Funding condition. There are a number of conclusions to be drawn from these estimates. First, the estimates suggest that unexpected opportunities can garner the attention of startup managers in a meaningful way (Hypothesis 1a). Secondly, while numerous resources may be important to the universe of startup attention, a desire for early stage customers appears to be of primary importance to the startup managers in our sample. Notably, the estimates suggest that the three resources other than funding garner at least the same level of attention (Networking, Feedback) if not more (Beta Customers) than the Funding resource, suggesting that startup managers do not give additional attention to the opportunity to acquire funding, despite its prominence in the empirical academic literature to date, thus rejecting Hypothesis 1b.

Table 3 demonstrates that startup managers pay attention to unanticipated offers of resources, and that they are specifically more interested in some resources than others (Beta Customers). Importantly, however, our experiment design has another a key feature which allows us to dig further into this phenomenon: it allows us to measure different levels of interest expressed. Specifically, in the continuum of expressions of interest, a startup can a) ignore an email, b) open an email, c) actively click a link in an email, and d) apply to the event described in that email. We operationalize this ordering and compare the treatments non-parametrically by running pairwise rank sum tests (two-sided) on the interest level captured by each

treatment. (We obtain similar results if we group “ignore” and “open” into a single group, consistent with the argument from MailChimp that opening may have lower accuracy) We utilize Mann-Whitney U-tests for this purpose. The Mann-Whitney U-test is used to compare differences between two independent groups when the dependent variable is either ordinal or continuous, but not normally distributed. The Mann-Whitney U-test requires that the dependent variable be ordinal or continuous level, and that the independent variable consist of two categorical, independent groups. Observations in the two groups should be independent, and there should be no overlap between groups. For each pair of resources we are comparing, our dependent variable is interest level (ordered, as above) and our independent variable is the resource, which has two independent groups (the two resource treatments we are comparing responses to).

Table 4 presents the results from the Mann-Whitney pairwise tests. As can be clearly seen from the table, Beta Customers captures significantly more interest than all other resources, namely opportunities to network ($p=0.001$), receive feedback on your idea ($p=0.000$), or secure external financing ($p=0.001$). There are no significant differences between any of the other three resources. This also helps to alleviate fears that any prior results are being driven by modeling assumptions. No other pairwise comparison is significantly different.

TABLE 4: MWU TESTS OF CAPTURED INTEREST

Prior Commitments and Accumulations

Next, we explore Hypothesis 2 that prior commitments towards R&D or Growth orientations will in turn lead to different allocations of managerial attention. Table 5 estimates models similar to those described in Table 3. Each column estimates a logit model where the dependent variable is an indicator variable taking a value of one for expression of any level of interest and zero otherwise. In each column, we estimate the model on a different subsample. In column (1), we restrict the sample to the 240 companies identified oriented towards R&D (defined as staff that is at least 50% comprised of scientists and engineers—a conservative definition within the universe of health tech startups). As in the models for the full sample in Table 3, we observe a significant and positive interest capture for the beta customers treatment

relative to the omitted category. Neither of the other two conditions exhibits statistically significant interest capture relative to the omitted category (Funding).

In contrast, when we estimate the model on the subsample of non-R&D oriented startups (column (2)), we observe a positive coefficient not only for the beta customer treatment, but also for the networking treatment condition, at around the same order of magnitude. The difference between the two groups of companies (R&D-oriented and non-R&D oriented) is consistent with what we might expect from the context. R&D-oriented startups still need beta customers to test their devices and products, but may be less interested in business-oriented networking opportunities. In contrast, startups with a smaller share of scientists and engineers are likely to be more business-oriented in nature, and thus express equal interest in networking with high-value business contacts as in securing beta customers. These differential allocations of attention across firms with different R&D orientations provide supporting evidence for Hypothesis 2.

Column (3) and (4) estimate the models on the subsamples that do and do not exhibit prior strategic choices that suggests they are oriented towards growth: incorporating in Delaware. While those startups that do not appear to be growth-oriented (column (4)) exhibit similar attention patterns to the R&D-oriented startups in column (2), Those that appear to be growth-oriented exhibit somewhat different patterns of attention. As can be seen in column (3), the growth-oriented subsample has a much lower coefficient loading for the beta customers treatment than for the other subsamples; the estimate is also significantly smaller in magnitude, and is marginally statistically significant ($p\text{-value} < 0.15$). However, they exhibit a positive and significant increased interest under the networking condition, relative to the omitted category of treatment, at a larger level of magnitude. This difference in allocation of attention across groups exhibiting a growth-orientation or not provide additional supporting evidence for Hypothesis 2. As in all the subsamples and in the full sample, the funding condition has no positive significant loading. Perhaps startups that exhibit evidence of a prior growth orientation likely have a set plan for acquiring beta customers, yet find the possibility of making new connections valuable.

TABLE 5: ATTENTION ACROSS DIFFERING ORIENTATIONS

Certainly, firm orientation towards different goals will impact resource accumulation choices. That said, prior resource accumulation is important in and of itself for managerial attention to further offer of resources. Importantly, there are distinct patterns of heterogeneity in terms of firm resources both across the firm lifecycle and specifically at the time of invitation to the pitch event specifically. This fact, taken in concert with our previous results suggesting attention capture is possible, lead us to next explore how attention capture differs across firms with different resource allocations. To this end, we rely on two key covariates: whether or not a firm holds patents, and the extent to which a firm is funded. For the purposes of the following estimations, we define a “well-funded” firm as one that has raised at least \$1.5 million. Importantly, though these covariates are correlated ($\rho=0.23$), they are not perfectly collinear, and as a matter of measurement they highlight different resource accumulations within the sample.

TABLE 6: BASIC TREATMENT EFFECTS SUBSAMPLED BY PRIOR RESOURCES

In Table 6, we test Hypothesis 3, that prior resource accumulation of the firm will result in different attention allocation by the firm across different resources offered, and examine the attention capture treatment effects taking these key resources into account. Again, these estimates represent logit models on whether or not the startup at least clicked the email link (expression of any level of interest). Columns (1) and (2) explore the subsamples of startups who did and did not raise significant funding, while columns (3) and (4) explore the subsamples of startups with and without patents. As can be seen from the estimates, startups who previously raised significant amounts of financing exhibit greater attention under the Networking and Beta Customer conditions. In contrast, those that did not raise much financing exhibit similar levels of managerial attention under all four treatment resources, suggesting no particular resources garners significantly more attention (though the coefficient on the Beta Customers condition is larger than

for the other conditions, it is not statistically significant). This evidence that firms allocate different levels of attention based on prior resource accumulation supports Hypothesis 3.

When we turn to prior accumulation of the intellectual property resource (patents), we observe that startups that have previously patented exhibit significantly positive managerial attention under the networking and Beta Customers conditions, relative to the Funding condition (omitted category) and the Feedback condition (no significant loading). In contrast, those startups without prior patents appear to exhibit significantly more managerial attention under the Beta Customers condition than under any of the other resource conditions. Thus, it appears that startups with prior resource accumulations value networking opportunities in addition to the potential to meet new beta customers. This evidence that firms allocate different levels of attention based on prior resource accumulation supports Hypothesis 3.

The results match our intuition on a number of dimensions. First, startups that have been successful in raising significant funding likely have at least some orientation towards operations and business outside of pure science and R&D, and towards growth. In this sense, we might think of a well-funded startup as intending to “play-the-game” at these sorts of entrepreneurial events, shaking hands, meeting the right people, and maintaining not only appearances, but also a robust rolodex of contacts. The fact that both types of prior resource accumulation appear to lend managerial attention to networking opportunities is consistent with the notion that once certain milestones are achieved (patents granted, fundraising thresholds) managerial attention is then freed up to pursue unanticipated resources. This in turn highlights the fact that a robust network is indeed a scarce resource in part because networking is a non-trivial endeavor that requires (but is not limited to) significant effort expenditure and search costs.

Relatedness

Perhaps one way for the startup management team to mitigate the effort expenditure and search costs associated with resource accumulation is by restricting their attention to areas and problem spaces more closely related to the startup’s field. This insight formed the basis of our Hypothesis 4, managers will allocate more attention to opportunities for resource accumulation if the opportunity appears closely related

to the disease area focus of the company. This hypothesis suggests that firm founders will limit attention paid to offers of unexpected resources that come from outside these related problem spaces and which may be less relevant to the startup or more difficult to make use of. To explore this hypothesis, we define a highly related company as one whose SBIR or Crunchbase blurb contains at least 3 of the same key words as the AHA's call for applicants. We then explore how the treatment effects vary by this relatedness score using logit estimations similar to those described in the previous tables.

TABLE 7: VARIATION IN TREATMENT EFFECTS BY RELATEDNESS

Table 7 extends our exploration of prior strategy by including variables centered around this concept of highly related firms. Panel A presents estimates of logit models similar to those in Tables 3, 5 and 6, but with the addition of a control for high relatedness. Column (1) estimates the model for full sample, while the remaining columns estimates models for each for the four orientation subsamples (R&D and non-R&D orientations and Growth and non-Growth orientations) and each of the four subsamples of prior resource accumulation (funding yes/no, patents yes/no).

In Panel A, column (1), we observe that adding the relatedness variable does not substantially change the loadings on the four treatment condition indicators in the full sample. High Relatedness itself, however, does load positive and significantly, confirming that a higher degree of relatedness appears to generate higher managerial attention. Across the columns, there are a few apparent patterns. The attention from startups with an R&D orientation is not mediated by the High Relatedness variable. High relatedness does, however, impact the attention of managers of startups whose orientation is not towards R&D, but rather towards business and operations. When we look at growth orientation, we see that startups with a prior growth orientation (as proxied for by DE incorporation) exhibit no increased attention if their firm's area of focus is highly related to the keywords describing the event, while those with no growth orientation exhibit significantly more interest if they are highly related.

We then turn to prior resource accumulation. We observe similar patterns across both types of resources we examine. Startups with prior funding or prior patenting do not appear to exhibit increased managerial attention due to high relatedness. In contrast, those startups who have not previously accumulated resources—either funding or patents—clearly exhibit significantly higher managerial attention when their startup’s area of focus is more highly related to the keywords used to describe the event focus.

Next, we turn to examining interactions of High Relatedness with the various resource conditions. In Panel B, we add four interaction terms to the models in Panel A. Because of known issues with interpreting interaction terms in non-linear models such as probit and logit models (see e.g. Ai and Norton, 2003),² we estimate linear probability models. Panel B column (1) presents the estimates of the fully interacted model for the full sample. Here, the main High Relatedness variable loses significance, but the interaction between the Feedback condition and High Relatedness is now statistically significant, suggesting that for the Feedback resource, relatedness matters for managerial attention, while for the other three resource conditions, relatedness does not appear to impact the interest exhibited by the startup’s management team. In column (2) and (3), we look at the subsamples with R&D orientation and No R&D orientation, respectively. For both subsamples of startups (those with and without an R&D orientation), we observe no statistical significant effect of High Relatedness, either in the main level variable or in the interaction terms. In columns (4) and (5), we turn to startups with and without a growth orientation. For startups with a growth orientation, the main effect of relatedness turns negative and statistically. At the same time, the interactions between High Relatedness and the Feedback and Networking conditions become strongly positive and statistically significant. In other words, the net effect of relatedness for startups under the Feedback and Networking conditions is positive and significant relative to the omitted category of funding, while for startups under the Beta Customer condition, Relatedness decreases managerial attention relative to the

² As discussed by Ai and Norton (2003), The magnitude of the interaction effect in nonlinear models does not equal the marginal effect of the interaction term, can be of opposite sign, and the statistical significance of the interaction effect cannot be tested with a simple t-test on the coefficient of the interaction term.

Funding condition. For startups without a growth orientation (column (5)), in contrast, the main effect of Relatedness is significant, large and positive, while only the interaction of Relatedness and Networking is statistically significant, and is negative. In other words, High Relatedness increases managerial attention under the other three resource conditions (Funding, Feedback and Beta Customers), but has a lesser effect under the Networking condition relative to the other three.

Turning to prior resource accumulation, in columns (6) and (7), we examine the subsamples of startups who have and have not raised significant amounts of funding prior to our email invitation. For both subsamples, the main effect of High Relatedness loses significance in the fully interacted models. For the well-funded subsample, the interaction between High Relatedness and the Feedback condition is positive and statistically significant; none of the other interaction terms load significantly. For the startups that did not raise significant funding prior, we see no significance on any of the interaction terms, suggesting that relatedness does not affect the attention borne by their managers to the offer of unexpected resources. Finally, in columns (8) and (9), we examine the subsamples of firms with and without patents. In both subsample, there is no significant loading on the main level effect of High Relatedness. For the subsample of startups with patents, we see no significant loadings on any of the interaction terms, while for the subsample without patents, we observe a positive and significant loading on the interaction of High Relatedness and the Networking condition.

Importantly, the results in sum suggest the theoretical construct of high relatedness has bearing in this setting providing limited support for Hypothesis 4. Specifically, the dimensions along which we would expect to see variation based on theoretical model do indeed exhibit have variation. By necessity, the findings of our experiment are exploratory in nature; having observed the heterogeneity across orientations and prior accumulations, our estimates can guide future qualitative research not the sources and mechanism this heterogeneity.

Discussion

During the last two decades, a great deal of attention has been given to the determinants and consequences of attention in organizations. Researchers have approached this topic with a variety of perspectives and methodological approaches. Yet the ability to observe a direct measure of managerial attention is often elusive. In this paper, we bring a new perspective to this well-trodden ground: that of the randomized experiment. By employing an experimental approach, we are able to generate data directly from the subjects of interest, providing new, direct, measures of managerial attention. We employ this experimental approach in an area that has been oft-overlooked by researchers exploring the attention-based view: the nascent firm.

Much of the existing work on the ABV work has focused on larger firms, where the span of control over a large amount of resources provides a constraint on the allocation of top management team's attention. Yet the core logic of the ABV can be applied to nascent firms as well, where the top management team must execute quickly across a broad number of issues or fail. In both cases, the ABV suggests that when attention must be applied sparingly, it is meted out according to pre-existing schema. This paper contributes to existing work on the ABV by providing empirical evidence supporting the notion that attention is a core issue for nascent firms. By building upon existing behavioral theory of the firm, this paper builds upon a growing effort to reconcile the active portfolio of theoretical constructs in entrepreneurship research with broader theory in organizational research.

By grounding our field experiment in one theoretical channel, the allocation of managerial attention, we are able to make substantial progress, both empirically and theoretically, towards our understanding of organizational processes within firms. Empirically, our paper further expands our understanding of the entrepreneurial process by highlighting the differential demand for resources that have received little research attention, and in particular, the role of beta customers in growing new ventures. While there is work demonstrating the importance of early customers to firm survival and growth (e.g. Larson, 1992), much more attention has been paid to the allocation of early-stage funding to new ventures. In part, the

attention paid to venture capital allocation is a function of data availability: firms do not readily disclose early customers. In part, the focus on venture capital also emerges from the insights gained from samples in firms that originate in hotbeds of growth entrepreneurship like Silicon Valley where early funding, ahead of customers or revenue, is common. Our field experimental approach allows us to estimate the demand for different resources across a broader sample of new firms.

Theoretically, we provide a useful complement to existing research efforts that seek to ground the entrepreneurial phenomenon in broader organizational theories. A growing body of work seeks to understand how new firms grow and adapt by leveraging existing theories of organizational learning and strategic change. For example, Kirtley and O'Mahoney (2019) find that the majority of potential pivots (i.e. unexpected paths to growth including new partners or resources) that are presented to new firms are met with inaction and inertia on the part of the top management team. While their research explicitly considers attention as a mechanism through which learning and strategic change are moderated, their results are bounded methodologically by a reliance on the emerging understanding of their research subjects through their longitudinal interview process. While our methodology cannot match the richness of insight gained through the qualitative approach in work like Kirtley and O'Mahoney (2019), it contributes to our understanding of the role of attention in the process of learning and strategic change in nascent firms by providing the same set of opportunities to a broad sample of firms and observing direct markers of attention in a setting that is natural for the entrepreneurial process: the email inbox. By controlling the timing of the unexpected opportunity to gain new resources, we are able to provide a direct test of the theoretical channels proposed by Ocasio (1997) and broadly support the role of attention in moderating the pursuit of new resources as they appear in a startup's environment.

Our paper also demonstrates a role for field experiments in the management and strategy literature. Field experiments—and in particular, randomized controlled trials—have been under-utilized in the management literature to date, despite the ability they provide to add to our ability to carefully test the relevance of theories in the field. To date, much of the work implementing field experiments in

entrepreneurship has largely focused on the treatment effects of a particular intervention. The potential for field experiments to contribute to our understanding of organizational theory, however, goes well beyond the realm of program evaluation. Here, we have attempted to craft our intervention in a manner that provides a first step down a path of future work: validating the predictions of a core theory within the broader behavioral theory of the firm, in a new context in which there has been limited empirical work.

While our findings validate core hypotheses regarding managerial attention to offers of unexpected new resources in the presence of existing strategic orientation and resource accumulation, further work is necessary to illuminate the mechanisms that drive the heterogeneous patterns we observe. In this sense, our paper represents a first foray into the understanding of how prior resource accumulation and strategic choices affect managerial attention. As suggested by Ocasio (2011), however, a full understanding of firm heterogeneity will require that we integrate the attention-based view with other perspectives to fully develop a dynamic theory of value creation in the entrepreneurial context. Field experiments open the possibility of tailoring our probes to rule in (or out) the interplay of different theoretical mechanisms in contexts, like entrepreneurship, that show substantial differences from the organizational conditions common in the contexts in which theories like the ABV were initially proposed. Thus, we believe that the careful deployment of field experiments measuring variation in managerial attention across different contexts will provide a key building block to integrate existing organizational theories in a parsimonious manner to provide a more powerful theoretical model of the entrepreneurial process.

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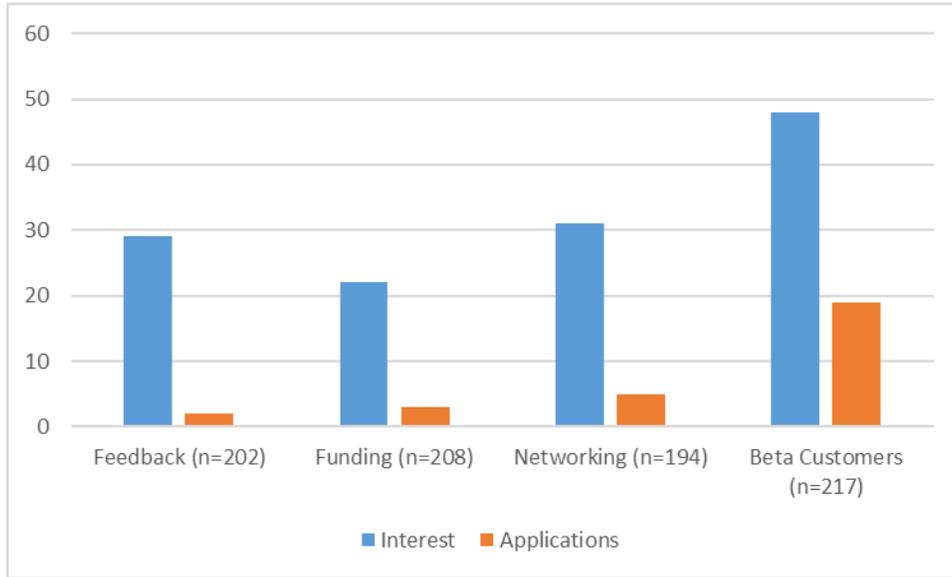
Figures and Tables

Figure 1: Experimental Treatments

Treatment	Email Subject	Email Body Text	Landing Page Text
	<p>[Experimental Condition]! Apply to pitch at the AHA Health Tech Competition 2018</p>	<p>The AHA Health Tech Competition offers innovative startups the opportunity to [Experimental Condition]</p>	<p>Join us for the Health Tech Competition from the American Heart Association (AHA) November 13 in Anaheim, CA. Highly qualified applicants will be selected to pitch their health startup company to [Experimental Condition]</p>
Feedback	Get Critical Feedback	<p>get feedback and advice from healthcare executives, investors and thought leaders. Participants will get critical feedback on their product and plans.</p>	<p>healthcare executives, investors and thought leaders. Participants will get critical feedback on their product and plans.</p>
Financing	Get Funded	<p>pitch in front of a large number of healthcare investors and potentially obtain financing. Participants will pitch to key decision makers from healthcare-focused VC firms, angel investors, and corporate VC arms.</p>	<p>a large number of healthcare investors and potentially obtain financing. Participants will pitch to key decision makers from healthcare-focused VC firms, angel investors, and corporate VC arms.</p>
Network	Network with Major Industry Players	<p>build out your network by interacting with key healthcare executives, investors and thought leaders. Participants will have the opportunity to network with a variety of major players in the healthcare industry.</p>	<p>key healthcare executives, investors and thought leaders. Participants will have the opportunity to network with a variety of major players in the healthcare industry.</p>
Beta Customer	Access Customers and Partners	<p>secure partnerships and working relationships with hospitals and large payors, including potential beta customers. Participants will pitch their products and services to key decision makers who are looking to partner with startup companies.</p>	<p>key decision makers who are looking to partner with startup companies. Participants will have the opportunity to secure partnerships and working relationships with hospitals and large payors, including potential beta customers.</p>

Notes: This figure presents the individual components of each of the four different email treatments as well as a framework for the experiment overall. Each treatment systematically varied key words in the subject line of the email, body text of the email, and body text on the landing page site.

Figure 2: Email Responses (Raw Data)



Notes: This figure displays the raw data results of the email experiment broken up by treatment. Blue columns show the number of times the embedded email link was clicked through, orange columns show the number of applications to the event. The sample size of each treatment group is presented in text.

Table 1: Summary Statistics

Variable	Mean	Std. Dev	Min	Max	Count
Incorporated in DE	0.646	0.48	0	1	821
LLC	0.252	0.44	0	1	821
Has Patents	0.266	0.44	0	1	821
Number of Patents	7.083	14.3	1	72	217
Raised Funds	0.376	0.49	0	1	821
Total Funding (in \$10,000s)	753.2	3543	0	46786.2	821
Founding Year	2012	2.66	2008	2018	821
Relatedness Score	3.088	2.61	0	14	821
R&D Oriented	0.292	0.455	0	1	821
# of LinkedIn Employees	6*	16.49	1	92	693

Notes: This table presents summary statistics for the invited firms in the experiment (N=821). Data on incorporation come from the State of Delaware’s Division of Corporate Entities Database. Data on patenting come from the USPTO where Has Patents is an indicator variable equal to 1 if the company had been granted at least one patent at the time of invitation. Fundraising data come from scraping the company’s Crunchbase profile, where Raised Funds is an indicator variable equal to 1 if the company had at least one round of funding listed on their crunchbase page at the time of invitation. Founding year is the earliest date from either their business registration form or their website founding from the WHOIS registry. The variable Relatedness Score refers to the number of key words in the firm abstract that match the AHA’s call for applicants. The Variable R&D Oriented refers to the number of scientists and engineers affiliated with a company via their LinkedIn profile. * Indicates Median instead of Mean.

Table 2: Treatment Condition Balance

Variable	Feedback	Funding	Networking	Beta Customers	P-Value
Well-Funded	0.286	0.33	0.291	0.265	0.584
Has Patents	0.28	0.251	0.227	0.3	0.454
R&D Oriented	0.257	0.291	0.262	0.323	0.479
Growth Oriented	0.617	0.698	0.634	0.64	0.404
Strongly Related Opportunity	0.491	0.43	0.39	0.423	0.28
Founding Year	2012.03	2012.51	2012.38	2012.12	0.352†
Obs	175	179	172	189	-

Notes: this table excludes emails that bounced and reports the means of key covariates by treatment group. The variables “Feedback,” “Funding,” “Networking,” and “Beta Customers” refers to which email treatment a company received. Well-funded refers to firms that have raised at least \$1.5 Million as indicated by their Crunchbase Page. Has Patents refers to firms that have successfully applied for and been granted at least one patent with the USPTO. R&D Oriented refers to firms that are oriented towards Research and Development, defined as at least 50% of employees identified as scientists and engineers from their coded linkedin pages. Growth oriented refers to firms that are oriented towards growth, defined as those incorporated in Delaware as indicated by the State of Delaware DCE database. Strongly related opportunity is an indicator variable=1 if a firm has at least 3 of the AHA’s key words in its Crunchbase or SBIR abstract and 0 otherwise. Founding year is the earliest date from either their business registration form or their website founding from the WHOIS registry. P-Values presented in the last column report Chi-square tests unless otherwise noted. †: Kruskal-Wallis test for equality of proportions. + p < 0.15, * p < 0.1, ** p < 0.05, *** p < 0.01

Table 3: Basic Treatment Effects

Treatment	(1) Clicked Link	(2) Applied	(3) Applied Opening
Feedback	0.349 (0.302)	-0.381 (0.918)	-0.459 (0.921)
Networking	0.475 (0.299)	0.592 (0.737)	0.718 (0.742)
Beta Customers	0.876*** (0.279)	1.881*** (0.629)	1.870*** (0.634)
Constant	-2.135*** (0.225)	-4.224*** (0.582)	-3.753*** (0.584)
Observations	821	821	521

Notes: This table reports Odds Ratios from logit estimations where the dependent variable is generated directly from the experiment and represents the binary indicator listed at the top of each column. The variables “Feedback,” “Networking,” and “Beta Customers” refers to which email treatment a company received. The “Fundraising” treatment serves as a reference group. Standard Errors are in parentheses. + p < 0.15, * p < 0.1, ** p < 0.05, *** p < 0.01

Table 4: Non-Parametric Paired Rank Sum Tests (Mann-Whitney U Tests)

Treatment	Feedback	Funding	Networking
Funding	0.677 (-0.417)		
Networking	0.231 (-1.197)	0.416 (-0.813)	
Beta Customers	0.000*** (-3.636)	0.001*** (-3.398)	0.001*** (-2.663)

Notes: This table reports pairwise Mann-Whitney U (rank-sum) tests comparing the distributions of response rates by treatment. The variables “Feedback,” “Networking,” “Funding,” and “Beta Customers” refers to which email treatment a company received. Data are generated from the experiment and the ranks used in these tests are as follows: 0-ignored, 1-opened, 2-clicked-3-applied. Z-scores are presented in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 5: Basic Treatment Effects by Prior Orientation

	(1)	(2)	(3)	(4)
Feedback	0.08 (0.50)	0.54 (0.39)	0.34 (0.40)	0.28 (0.47)
Networking	(0.39) (0.55)	0.872** (0.37)	0.796** (0.37)	(0.14) (0.51)
Beta Customers	1.015** (0.43)	0.796** (0.37)	0.567+ (0.38)	1.214*** (0.43)
Constant	-1.686*** (0.34)	-2.398*** (0.30)	-2.310*** (0.29)	-1.810*** (0.36)
Observation	240	581	530	291
Subsample	R&D Oriented	Not R&D Oriented	Growth Oriented	Not Growth Oriented

Notes: This table reports logit estimations where the dependent variable is generated directly from the experiment and represents the binary indicator =1 if the firm clicked the link embedded in its respective experimental email and 0 otherwise. The variables “Feedback,” “Networking,” and “Beta Customers” refers to which email treatment a company received. The “Fundraising” treatment serves as a reference group. R &D Oriented refers to firms that are oriented towards Research and Development, defined as at least 50% of employees identified as scientists and engineers from their coded linkedin pages. Growth oriented refers to firms that are oriented towards growth, defined as those incorporated in Delaware as indicated by the State of Delaware DCE database. Standard Errors are in parentheses. + p < 0.15, * p < 0.1, ** p < 0.05, *** p < 0.01

Table 6: Basic Treatment Effects by Prior Resources Subsample

	(1)	(2)	(3)	(4)	(5)
	I(Interest)	I(Interest)	I(Interest)	I(Interest)	I(Interest)
Feedback	0.349 (0.302)	0.787 (0.654)	0.201 (0.343)	0.850 (0.734)	0.230 (0.334)
Networking	0.475 ⁺ (0.299)	1.650 ^{***} (0.600)	-0.041 (0.362)	1.685 ^{**} (0.693)	0.115 (0.340)
Beta Customers	0.876 ^{***} (0.279)	2.003 ^{***} (0.585)	0.429 (0.326)	1.462 ^{**} (0.674)	0.744 ^{**} (0.311)
Constant	-2.135 ^{***} (0.225)	-2.773 ^{***} (0.515)	-1.914 ^{***} (0.252)	-2.909 ^{***} (0.593)	-1.931 ^{***} (0.245)
Observations	821	243	578	218	603
Subsample	Full Sample	Well Funded	Not Well Funded	Has Patents	No Patents

Notes: This table reports logit estimations where the dependent variable is generated directly from the experiment and represents the binary indicator =1 if the firm clicked the link embedded in its respective experimental email and 0 otherwise. The variables “Feedback,” “Networking,” and “Beta Customers” refers to which email treatment a company received. The “Fundraising” treatment serves as a reference group. Well-funded refers to firms that have raised at least \$1.5 Million as indicated by their Crunchbase Page. Has Patents refers to firms that have successfully applied for and been granted at least one patent with the USPTO. Standard Errors are in parentheses. ⁺ p < 0.15, * p < 0.1, ** p < 0.05, *** p < 0.01

Table 7: Variation in Treatment Effects by Relatedness

Panel A

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	I(Interest)								
Feedback	0.327 (0.303)	0.020 (0.506)	0.541 (0.387)	0.328 (0.402)	0.404 (0.478)	0.812 (0.659)	0.206 (0.344)	0.830 (0.736)	0.218 (0.335)
Networking	0.491 ⁺ (0.299)	-0.381 (0.554)	0.895 ^{**} (0.375)	0.799 ^{**} (0.374)	-0.111 (0.517)	1.646 ^{***} (0.600)	-0.021 (0.364)	1.675 ^{**} (0.694)	0.148 (0.341)
Beta Customers	0.875 ^{***} (0.279)	1.008 ^{**} (0.430)	0.799 ^{**} (0.374)	0.560 ⁺ (0.376)	1.540 ^{***} (0.458)	2.031 ^{***} (0.592)	0.472 ⁺ (0.328)	1.468 ^{**} (0.675)	0.733 ^{**} (0.312)
Highly Related	0.393 ^{**} (0.193)	0.317 (0.337)	0.466 [*] (0.241)	0.060 (0.260)	1.244 ^{***} (0.324)	-0.118 (0.358)	0.568 ^{**} (0.236)	0.154 (0.399)	0.459 ^{**} (0.223)
Constant	-2.320 ^{***} (0.246)	-1.813 ^{***} (0.374)	-2.634 ^{***} (0.330)	-2.336 ^{***} (0.311)	-2.531 ^{***} (0.430)	-2.724 ^{***} (0.535)	-2.191 ^{***} (0.284)	-2.980 ^{***} (0.623)	-2.146 ^{***} (0.271)
Observations	821	240	581	530	291	243	578	218	603
Subsample	Full	R&D Orientation	No R&D Orientation	Growth Orientation	No Growth Orientation	Well Funded	Not Well Funded	Has Patents	No Patents

Standard errors in parentheses

⁺ $p < 0.15$, ^{*} $p < 0.1$, ^{**} $p < 0.05$, ^{***} $p < 0.01$

Panel B

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	I(Interest)	I(Interest)	I(Interest)	I(Interest)	I(Interest)	I(Interest)	I(Interest)	I(Interest)	I(Interest)
Feedback	-0.024 (0.049)	-0.395 (0.744)	-0.014 (0.654)	-0.633 (0.612)	1.076 (1.141)	-0.103 (0.101)	-0.004 (0.056)	0.028 (0.097)	-0.042 (0.057)
Networking	0.044 (0.047)	-0.529 (0.674)	1.026* (0.553)	0.101 (0.459)	1.762+ (1.107)	0.155* (0.087)	-0.004 (0.056)	0.128 (0.098)	0.019 (0.055)
Beta Customers	0.107** (0.047)	0.581 (0.546)	1.130** (0.548)	0.283 (0.462)	2.447** (1.061)	0.278*** (0.101)	0.070 (0.054)	0.127+ (0.084)	0.101* (0.057)
Highly Related	0.009 (0.051)	-0.395 (0.744)	0.549 (0.611)	-1.475* (0.789)	2.485** (1.096)	-0.103 (0.091)	0.063 (0.061)	-0.024 (0.092)	0.024 (0.061)
Feedback X Highly Related	0.125* (0.072)	0.955 (1.069)	0.864 (0.820)	2.338** (1.000)	-0.758 (1.274)	0.292** (0.137)	0.066 (0.085)	0.062 (0.134)	0.152* (0.086)
Networking X Highly Related	0.027 (0.074)	0.395 (1.182)	-0.260 (0.755)	2.138** (0.921)	-3.019** (1.328)	0.073 (0.137)	0.003 (0.087)	0.094 (0.140)	-0.012 (0.087)
Beta Customers X Highly Related	0.019 (0.071)	1.077 (0.908)	-0.661 (0.754)	1.212 (0.920)	-1.067 (1.219)	0.004 (0.136)	-0.027 (0.084)	0.027 (0.128)	0.012 (0.085)
Constant	0.102*** (0.033)	-1.551*** (0.416)	-2.681*** (0.462)	-1.893*** (0.323)	-3.497*** (1.015)	0.103* (0.060)	0.101** (0.040)	0.063 (0.062)	0.116*** (0.040)
Observations	821	240	581	530	291	243	578	218	603
Subsample	Full	R&D Orientation	No R&D Orientation	Growth Orientation	No Growth Orientation	Well Funded	Not Well Funded	Has Patents	No Patents

Notes: This table reports estimations where the dependent variable is generated directly from the experiment and represents the binary indicator =1 if the firm clicked the link embedded in its respective experimental email and 0 otherwise. The variables “Feedback,” “Networking,” and “Beta Customers” refers to which email treatment a company received. The “Fundraising” treatment serves as a reference group. Strongly related opportunity is an indicator variable=1 if a firm has at least 3 of the AHA’s key words in its Crunchbase or SBIR abstract and 0 otherwise. R&D Oriented refers to firms that are oriented towards Research and Development, defined as at least 50% of employees identified as scientists and engineers from their coded LinkedIn pages. Growth oriented refers to firms that are oriented towards growth, defined as those incorporated in Delaware as indicated by the State of Delaware DCE database. Well funded refers to firms that have raised at least \$1.5 Million as indicated by their Crunchbase Page. Has Patents refers to firms that have successfully applied for and been granted at least one patent

with the USPTO. In Panel A we report logit estimations. In Panel B we report linear probability models. The interaction terms in Panel B are calculated by multiplying the Strongly Related indicator variable by the Treatment Indicator. Standard Errors are in parentheses. + $p < 0.15$, * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$